1. Which best describes the structure of a cell membrane?
   A) Proteins between two bilayers of glycolipids
   B) Proteins embedded in a bilayer of phospholipids
   C) Phospholipids between two layers of protein
   D) Cholesterol embedded in a bilayer of phospholipids

2. Osmosis can be defined as ______________ across a semipermeable membrane.
   A) the diffusion of water
   B) the diffusion of nonpolar molecules
   C) active transport
   D) the diffusion of a solute
   E) endocytosis

3. In a hypotonic solution, an animal cell will
   A) lyse.
   B) experience turgor.
   C) neither gain nor lose water.
   D) shrivel.
   E) lose water.

4. Which of the following statements is true among all types of passive diffusion?
   A) Proteins are needed to transport molecules across the membrane.
   B) The concentration gradient is the driving force.
   C) Only small polar molecules are able to cross the plasma membrane.
   D) Only small nonpolar molecules are able to cross the plasma membrane.
   E) Ions never cross the plasma membrane by passive transport.

5. The sodium concentration in a cell is ten times less than the concentration in the surrounding fluid. How can the cell move sodium out of the cell?
   A) Passive transport
   B) Diffusion
   C) Active transport
   D) Osmosis
   E) Any of these processes

6. Plants convert the energy of sunlight into
   A) the energy of motion.
   B) carbon dioxide and water.
   C) chemical energy.
   D) minerals.
   E) kinetic energy.
7. Oxygen can enter the cell by
   A) diffusion
   B) osmosis
   C) active transport
   D) facilitated transport

8. Energy is the capacity to perform work. _______ energy is the energy of motion; _______ is stored energy.
   A) Potential energy; kinetic energy
   B) Kinetic energy; potential energy

9. ATP contains
   A) one phosphate group
   B) two phosphate groups
   C) three phosphate groups
   D) four phosphate groups

10. Most of a cell's enzymes are
    A) lipids.
    B) proteins.
    C) amino acids.
    D) nucleic acids.
    E) carbohydrates.

11. In cellular respiration, _______ is converted to _______ and _______.
    A) glucose; carbon dioxide; water
    B) glucose; oxygen; water
    C) oxygen; glucose and carbon dioxide
    D) carbon dioxide; glucose and oxygen

12. In glycolysis, glucose is split into two molecules of _________.
    A) G3P   B) lactose   C) ethanol   D) pyruvate   E) glycogen

13. The term anaerobic means
    A) without bacteria.
    B) without ATP.
    C) without CO₂.
    D) with O₂.
    E) without O₂.

14. Which of the following statements regarding photosynthesis and cellular respiration is true?
    A) Photosynthesis occurs in chloroplasts, and cellular respiration occurs in mitochondria.
    B) Photosynthesis occurs in mitochondria, and cellular respiration occurs in chloroplasts.
    C) Photosynthesis occurs in mitochondria and in chloroplasts.
    D) Cellular respiration occurs in mitochondria and in chloroplasts.
    E) Neither cellular respiration nor photosynthesis occurs in either mitochondria or chloroplasts.
15. How do cells capture the energy released by cellular respiration?
   A) They produce ATP.
   B) They produce glucose.
   C) They store it in molecules of carbon dioxide.
   D) The energy is coupled to oxygen.
   E) They store it as thermal energy.

16. The overall equation for the cellular respiration of glucose is
   A) \( \text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{O}_2 \rightarrow 5 \text{CO}_2 + 6 \text{H}_2\text{O} + \text{energy} \).
   B) \( 5 \text{CO}_2 + 6 \text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{O}_2 + \text{energy} \).
   C) \( \text{C}_6\text{H}_{12}\text{O}_{12} + 3 \text{O}_2 \rightarrow 6 \text{CO}_2 + 6 \text{H}_2\text{O} + \text{energy} \).
   D) \( \text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{O}_2 \rightarrow 6 \text{CO}_2 + 6 \text{H}_2\text{O} + \text{energy} \).
   E) \( \text{C}_6\text{H}_{12}\text{O}_6 + \text{energy} \rightarrow 6 \text{CO}_2 + 6 \text{H}_2\text{O} + 6 \text{O}_2 \).

17. A child is brought to the hospital with a fever of 107°F. Doctors immediately order an ice bath to lower the child's temperature. Which of the following statements offers the most logical explanation for this action?
   A) Elevated body temperature will increase reaction rates in the child's cells and overload the limited number of enzymes found in the cell.
   B) Elevated body temperatures may denature enzymes. This would interfere with the cell's abilities to catalyze various reactions.
   C) Elevated body temperatures will increase the energy of activation needed to start various chemical reactions in the body. This will interfere with the ability of enzymes to catalyze vital chemical reactions.
   D) Elevated body temperatures cause molecules to vibrate more quickly and prevent enzymes from easily attaching to reactants. This would slow vital body reactions.
   E) Elevated body temperatures easily break the covalent bonds linking biologically important molecules. This will cause a general breakdown of cell structures.

18. Which of the following is NOT true of Miller and Urey's experiments?
   a. They assembled a reducing atmosphere excluding \( \text{O}_2 \).
   b. They used electrodes to discharge sparks to simulate lightning.
   c. They placed cosmic dust into ocean water and heated it to 100°C.
   d. Glycine and alanine were produced.
   e. Within a week, 15% of \( \text{CH}_4 \) was converted into other carbon compounds.

19. What is the most likely origin of chloroplasts and mitochondria?
   a. Serial endosymbiosis of first a heterotrophic bacterium, and then in plants, a subsequent acquisition of cyanobacteria.
   b. Endosymbiosis of an ancestral prokaryote which diverged to form these organelles in a host which eventually gave rise to eukaryotes.
   c. Uptake of DNA of eukaryotes from dead bacteria gave rise to new combinations, eventually forming these organelles through natural selection.
   d. Ancestors to plants picked up a cyanobacterium which gave rise to chloroplasts. Animal ancestors did the same to a heterotrophic bacterium to establish mitochondria.
   e. More than one of these answers is believed to be correct by most scientists.
20. Choose the most correct statement about the two phases of photosynthesis.
   a. The light-dependent reactions occur in the cytosol; the light-independent reactions occur in the stroma.
   b. The products of the light-dependent reactions are ATP, NADPH, and O₂; the products of the light-independent reactions are ADP, NADP⁺, and sugar.
   c. The light-dependent reactions occur during the daylight hours; the light-independent reactions occur when it is dark.
   d. The light-dependent reactions produce water as a by-product; the light-independent reactions produce carbon dioxide as a waste product.
   e. The products of the light-dependent reactions are ADP, NADP⁺, and O₂; the products of the light-independent reactions are ATP, NADPH, and sugar.

**Bonus Questions:**

The “universal energy currency” of the cell is ______________. It is used to directly power everything from muscle contraction to transport to building macromolecules.

What are the **products** of alcoholic fermentation by yeast?

Why would a plant **not** grow well in a 100% oxygen chamber?

Where does most of the mass (dry weight) of a tree **come from**?